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U.S. Department of Energy, Office of Integration and Disposition

TIE QUARTERLY

Technical Information Exchange: "Sharing Experience, Expertise, and Lessons Learned."

Savannah River Site
A Key Department of Energy Installation

The Savannah River Site (SRS) was constructed during the early 1950s to produce basic materials used in the fabrication of nuclear weapons - primarily tritium and plutonium-239. A total of five reactors were built on the site to produce these materials by irradiating target materials with neutrons. Complementing the reactors were two chemical separations plants, tritium handling facilities, a heavy water extraction plant, a nuclear fuel and target fabrication facility, and waste management facilities. The first of the five production reactors started operation in December 1953. Substantial supporting infrastructure was installed to make the site self-sufficient.

Ariel view of K Reactor, Savannah River Site

Irradiated fuel and target assemblies were moved from the reactors to the chemical separations facilities, known as "canyons," for processing to separate useful products from the waste. The useful products, including uranium, plutonium, and other heavy elements, were further refined into nuclear materials, and some were shipped to other DOE sites for final use.

SRS missions have shifted over the years in response to changing defense requirements. All five production reactors are now permanently shut down, a reflection of improved relations with the former Soviet Union. SRS still remains a key site in the defense complex, however, SRS missions have evolved into three main areas: nuclear weapons stockpile stewardship, which includes ensuring the safe and reliable recycle, delivery, and management of tritium resources; nuclear materials stewardship, which is the management of excess nuclear materials including transportation, stabilization, storage and disposition to support nonproliferation initiatives; and environmental stewardship, which involves management, treatment and disposal of radioactive and nonradioactive wastes resulting from operations.

ENVIRONMENTAL LEGACY

The SRS environmental legacy is, in large part, the result of industrial practices that by today's standards are unacceptable. Those practices were state-of-the-art at the time but nevertheless led to creation of 515 inactive waste sites that have been identified, and ground water contamination beneath an estimated five percent of the site's 310 square mile area. The waste sites range in size from tens of square yards to major portions of the 195-acre burial ground complex for low-level radioactive waste disposal. The sites include basins, pits, piles,

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A Note From the Office of Integration and Disposition

Technical Information Exchange (TIE) Workshops, TIE Quarterly publications, and the TIE web site have been important forums for sharing Environmental Management (EM) expertise and experience across the Department of Energy (DOE) complex for nearly a decade. On occasion, however, it is necessary to obtain feedback from participants, readers, and users of these vehicles in order to determine the effectiveness and true value of TIE.

Throughout this TIE Quarterly you will see highlighted sections containing comments and expressions of appreciation from those who have benefitted from the "TIE experience;" those from DOE sites who are actively engaged in the EM cleanup effort. Take time to read how TIE has served their needs and, if you have specific examples of benefits gained through TIE, we are sincerely interested in hearing from you. TIE has always strived to be your forum for sharing ideas, experiences, and results with peers from across the complex. Your input is valued and serves as an important factor in determining the future of TIE, and how it may better serve your needs. Send your comments and information to Adrienne DeBacker, ATL International, Inc., at amg@erols.com. Thank you

Very truly yours,

Mary McCune, DOE EM TIE Lead

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landfills, and associated ground water. The environmental challenges may be loosely grouped into the following descriptions, based on processes or operational practices:

- **Seepage basins** - serving reactors and chemical separation facilities, which received oils, ash, and various radionuclides, especially tritium.
- **Solvent contamination in ground water** - especially in the administration and materials manufacturing area and laboratory areas in the northwestern edge of the site. There is also oil, gasoline, grease, and sludge in this area. A large part of this problem has resulted from degreasing solvents being discharged to a settling basin, along with acids, caustics, and metals.

Ariel view of F Canyon at the Savannah River Site

- **Landfills, rubble pits and piles (some of which were used for burning waste), and pits** - for the disposal of chemicals, metals, and pesticides, including solvents.
- **The low-level radioactive burial ground** - a 195 acre burial ground complex, resulting in impacts on ground water from metals and tritium.

The waste sites contain a "mixed bag" of contaminants, including construction rubble, petroleum, lead, batteries, paint, polychlorinated biphenyls (PCBs), acids, caustics, salts, pesticides, plastics, rubber, asbestos, and municipal solid waste. Radiological contaminants include heavy metals and tritium.

Weapons material production produced unusable byproducts and radioactive waste. About 34 million gallons of high-level radioactive liquid waste are stored in large underground tanks. In addition to the high-level waste, there are also low-level radioactive solid and liquid wastes, transuranic waste (which contains alpha-emitting isotopes), hazardous waste, and mixed waste.

NEW AND CONTINUING MISSIONS

Tritium - SRS will continue as the nation's only facility for recycling and reloading tritium from nuclear weapons reservoirs returned from service. Recycling tritium allows the United States to stretch its tritium supplies.

Furthermore, DOE has announced that its primary new source of tritium will be an existing commercial reactor in the Tennessee Valley Authority (TVA) system. A new tritium extraction facility is to be built at SRS in the next few years to extract tritium created in the TVA light-water reactors.

Plutonium Disposition- Plutonium stabilization now being conducted at SRS will be expanded to include materials from dismantled weapons and surpluses from other DOE sites. SRS will be the location for the Department's plutonium pit disassembly and conversion, mixed oxide fuel fabrication and plutonium immobilization facilities. These missions establish SRS's vital role in plutonium management for DOE.

Spent Fuel - SRS will receive and store aluminum based spent nuclear fuel from domestic and foreign research reactor programs, where it will be prepared for interim and, eventually, geologic storage. To reduce the potential for criticality, proliferation, and to reduce storage volume, a new treatment technology called melt-dilute is being developed at SRS. The technique will melt the spent fuel assemblies and will dilute the Uranium- 235 isotopic content to below 20 percent. The process is simple and versatile.

Canyon Operations - SRS has its two primary separations facilities, canyons, located in F and H areas. The canyons, together with the FB Line and HB Line located atop the canyons, are where nuclear materials historically have been chemically recovered and purified.

HB Line has produced plutonium-238 for NASA. In 1995, SRS completed a five-year campaign to supply plutonium-238 for NASA's Cassini mission, an unmanned expedition to the planet Saturn, which was launched October 13, 1997.

Currently, both canyons continue to stabilize and manage most of the remaining inventory of plutonium-bearing materials at SRS. F Canyon is scheduled to operate until about 2002 to

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stabilize SRS materials. H Canyon is scheduled to operate until 2006 and will be used to convert a large quantity of weapons-usable highly enriched uranium (HEU) to low-enriched material, making the uranium suitable for use as fuel in commercial power reactors.

Waste Management - The Defense Waste Processing Facility (DWPF) is currently processing the high-level liquid radioactive waste being stored in the large underground tanks, bonding radioactive elements in borosilicate glass, a stable storage form. DWPF began radioactive operations in March 1996.

Much of the volume in the tanks can be separated into a relatively low-level radioactive salt solution. This solution is mixed with cement, ash, and furnace slag and poured into permanent concrete monoliths for disposal at a facility called Saltstone.

The site's solid, low-level radioactive waste includes items such as protective clothing, tools and equipment that have become contaminated with small amounts of radioactive material. In October 1994, SRS opened engineered, concrete vaults for permanent disposal of solid low-level waste. As the nation's first state-of-the-art waste vaults, they provide significantly better isolation from the environment than previous in-ground disposal methods (certain very low-level wastes are still disposed of in engineered trenches).

Waste containing transuranic (TRU) nuclides (radioactive elements with an atomic number greater than uranium 92) is temporarily stored at SRS, pending eventual shipment to the Waste Isolation Pilot Plant in New Mexico. Hazardous wastes and mixed wastes are being stored on site in Resource Conservation and Recovery Act-permitted facilities until appropriate treatment facilities are operational.

Environmental Restoration - To date, 340 acres of land have been remediated. Of the 515 inactive waste sites identified, 277 have been closed or are remedial design. Eight of eleven areas where ground water is contaminated have treatment systems running. Almost four billion gallons of ground water have been treated, with over 925,000 pounds of solvents removed. Even though the site has had success, this cleanup process is expected to take decades.

Research and Development - The Savannah River Technology Center (SRTC) - the site's applied research and development laboratory - creates, tests and deploys solutions to the site's technological challenges. SRTC researchers have made significant advances in glass technology, hydrogen technology, non-proliferation technology, environmental characterization and cleanup, sensors and probes, and other fields.

Defense Waste Processing Facility at the Savannah River Site

The laboratory's 750-person staff includes several internationally recognized experts; one-fourth of the research staff holds Ph.Ds. SRTC's unique facilities include biotechnology laboratories, laboratories for the safe study and handling of radioactive materials, a field demonstration site for testing and evaluating environmental cleanup technologies and laboratories for ultra-sensitive measurement and analysis of radioactive materials.

Today, while the laboratory continues to solve the site's technological challenges, half of its work now comes from non-SRS customers, including DOE-Headquarters, other DOE sites and other federal agencies. The laboratory's largest work-for-others contract to date is a $31 million, multi-year contract to demonstrate and evaluate the processes that will be used at the Hanford Site to treat and dispose of the waste in Hanford's waste tanks.

Subsurface Contaminants Focus Area - SRTC was selected as the Lead Laboratory for the Subsurface Contaminants Focus Area, a national program devoted to developing and implementing technology solutions to meet a broad spectrum of soil and ground water remediation needs complex-wide. The Lead Laboratory is a virtual organization managed by SRTC, and is composed of technical experts from 10 partner national laboratories. The lead lab provides the Focus Area with a sound technical basis for operation, long-range planning for technical investments, and technical assistance to the various DOE sites across the complex.

Economic Development - Because of the increased emphasis on sharing the site's expertise with the nation that, for more than four decades has invested in its work, SRTC now forms

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Golden, Colorado - Rocky Flats

"In a nutshell, the TIE Workshops are a central gathering of project-involved managers from throughout the DOE community. Hence, the TIE forum presents an opportunity to display our field proven technology to an excellent cross section of both educated and motivated DOE managers. This venue has saved both thousands of dollars in travel expenses and hundreds of hours of travel and potential customer qualification time."

A Milestone--D&D Combines Two Ds into One!

Representatives from the Department of Energy's (DOE's) Headquarters/Field Office National Deactivation Committee and National Decommissioning Committee met July 25-26, 2000, in Germantown, Maryland, to combine the two committees into a single steering committee that will address the entire facility disposition process. The committees made the decision to join together during a spring meeting held this year in Richland, Washington. The decision was prompted, in part, by the recent Office of Environmental Management (EM) reorganization in which integration functions for both deactivation and decommissioning were merged into a single office, the Office of Integration and Disposition (EM-20). The decision was also influenced by DOE Order 430.1A, Life Cycle Asset Management (LCAM), which addresses facility disposition as a seamless process encompassing facility transition, deactivation, decommissioning, and surveillance and maintenance. The LCAM process largely mirrors the manner in which deactivation and decommissioning activities are actually being conducted in the field.

Patty Bubar, Associate Deputy Assistant Secretary, Office of Integration and Disposition, addresses the new DOE Facility Disposition National Committee

David Huizenga, Deputy Assistant Secretary of EM-20, and Patty Bubar, newly appointed Associate Deputy Assistant Secretary to Huizenga, addressed the new committee and agreed that merging the two committees made sense. Bubar's perception is that EM had a deactivation initiative, which was very effective. It evolved into the National Facility Deactivation Initiative and the National Deactivation Committee. Concurrently, the former Office of Environmental Restoration made significant progress in the decommissioning area, which included the workings of the National Decommissioning Committee. Bubar said she learned the differences between deactivation and decommissioning are slight; therefore it is a step in the right direction to combine these two activities into one.

James Davis III, DOE-OAK (foreground left) and Clayton Barrow, DOE-NV take note of new changes in the Committees

Huizenga stated the committee's functional area is very important because: 1) pipeline issues [for former operating facilities being transferred to EM] are becoming clearer; 2) facility disposition cannot be avoided for much longer; and 3) EM needs to avoid safety incidents. The challenge will be to put a message together that can be communicated to DOE senior management and to Congress. The message must clearly articulate that facility disposition must be addressed, despite not being a part of compliance actions. Huizenga emphasized this is an area that will get serious management attention, and this is the group that can bring issues into focus. Bubar pointed out that if the messages is tied to making [site closure] progress and to properly managing disposition projects, this would help carry it forward, and would make a difference in the budget for disposition activities. The message will be communicated with Carolyn Huntoon, EM Assistant Secretary.

Huizenga went on to explain that Huntoon has challenged EM-20 to work with field and operations offices to resolve issues. Huntoon wants him (Huizenga) to get to grass root issues of activities such as D&D, and to work with personnel on the front line. He pointed out that this new Facility Disposition National Committee provides an opportunity to work together and to provide the focus that is often lacking. This committee and its predecessors are doing something - despite budget limitations. He also stated that we must share information, and not to do so is criminal.

Andy Szilagyi, Office of Technical Program Integration (EM-22), discussed a charter representing the new joint Deactivation and Decommissioning Committee -- organizational structure and membership, and roles and responsibilities of members. In other words, this meeting was intended to define "who we are, what we do, and how we do it."

The mission for the newly formed DOE Facility Disposition National Committee is to identify, promote, and advocate the implementation of complex-wide strategies, policy, and direction to manage DOE's facility disposition initiatives in a manner that will minimize life cycle costs and reduce the risk associated with DOE facilities. These actions will provide significant benefits in improving safety, reducing risks and mortgage, and reaching closure at DOE sites. The new National Committee will accomplish this mission by providing leadership through a consortium of field offices and Headquarters organizations.

For more information contact Andy Szilagyi, EM-22 at 301-903-4278, email andrew.szilagyi@em.doe.gov or Mary McCune, EM-22 at 301-903-8152, email mary.mccune@em.doe.gov.

Technology Safety Data Sheets: Tool to Protect Workers from the Hazards of Environmental Clean-Up Technologies

The Department of Energy (DOE) faces an unprecedented environmental cleanup task for the nuclear weapons complex, an area larger than Delaware, Rhode Island, and the District of Columbia combined. The federal government on research, development, and demonstration programs for new clean-up technologies is spending approximately 2 to 3 billion dollars annually. Unfortunately, worker health and safety considerations have not been routinely included in the design of these technologies and there have been several fatalities. Taking the lead in correcting this deficiency, DOE has been pilot testing an informational tool for providing workers, industrial hygienists, safety professionals, and other stakeholders with guidance on avoiding potential hazards in individual technologies.

The Technology Safety Data Sheet (TSDS) is a technology-specific document designed to provide, among other information, the identity and relative risk of safety and health hazards associated with the technology. It can be used as a tool to manage safety throughout the technology development and implementation process and provide developers with a method to collect and report hazard information in a form that is understood by the user community. It was developed through consensus in a national technical workshop and was intended to be the technology version of the now familiar Material Safety Data Sheet (MSDS). There is currently no regulatory mandate for a TSDS to be developed or for the format to be used if one is developed. Guidelines from a consensus document developed through a second national technical workshop recommends that the following elements are, at a minimum, contained in the TSDS: Technology Identity, Process Description, Process Diagram or Photograph, Contaminants and the Medium, Associated Safety Hazards, Associated Health Hazards, Phase Analysis, Health and Safety Plan Required Elements, Comments and Special Considerations, and Case Studies. DOE is currently reviewing the TSDS and obtaining information on its usefulness and how it will be implemented during the development of technologies.

Conference Announcement

2001 International Containment & Remediation Technology Conference and Exhibition, June 10-13, 2001, Orlando, Florida. Sponsored by U.S. Department of Energy, U.S. Environmental Protection Agency, U.S. Navy, Dupont, National Aeronautics & Space Administration, and the IT Group. The purpose: to advance the deployment of innovative technologies and showcase many R&D efforts for developing technologies. The conference will emphasize the remediation and containment of DNAPL's, heavy metals and radionuclides through case studies in either technical focus areas. Abstracts are welcome. For more information visit the website at http://www.containment.fsu.edu. Abstracts are due January 17, 2001. Workshops and case studies of site characterization/remediation efforts and exhibits are offered.

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strategic partnerships with private industry, academia and other government agencies to apply the laboratory's unique expertise to challenges of mutual interest. For example, SRTC, working with a broad-based consortium, applied its extensive hydrogen expertise to the development of a hydrogen-fueled bus that became part of the City of Augusta's public transit fleet before being shipped to another DOE site for further development.

The laboratory also shares its expertise by licensing private companies to manufacture and/or market technologies created at SRTC, a move that helps American businesses sharpen their competitive edge and provides taxpayers a second return on their investment.

Environment - Originally farmland, SRS now encompasses a timber and forestry research center managed by the U.S. Forest Service. The site also houses the Savannah River Ecology Laboratory, an environmental research center operated for DOE by the University of Georgia.

In 1972, DOE's predecessor agency, the Atomic Energy Commission, designated SRS as the first National Environmental Research Park. The site is home to the bald eagle and the red-cockaded woodpecker, an endangered species. Other endangered species, including the shortnose sturgeon, peregrine falcon and wood stork, visit the site from time to time. Other wildlife commonly found on the site includes alligators, whitetailed deer, wild turkeys, and otters.

Aiken, South Carolina - Savannah River

"TIE keeps participants abreast with innovative technologies being used at the various sites and provides a forum for communication within the DOE Complex. TIE provides lessons learned and sharing expertise."

Cincinnati, Ohio - Fernald Field Office

"TIE provides a good forum to share information, ideas, and successful approaches to common or similar problems from the ER perspective."

New Mexico's Cerro Grande Fire Rehabilitation

INTRODUCTION

On May 4, 2000, in the late evening, fire personnel at Bandelier National Monument, National Park Service, ignited a prescribed fire with an approved plan. Firing and line control occurred during the early morning of May 5. Sporadic wind changes caused some spot fires within the contained area on the upper eastern fire line to spread. Because of these spot fires, the prescribed fire was declared a wildfire during the afternoon of May 5. On May 7 winds increased significantly from the west and resulted in major fire activity and ultimately caused the fire to move out of control to the east on the Santa Fe National Forest.

In its most extreme state on May 10, the Cerro Grande Prescribed Fire was carried by very high winds, with embers blowing a mile or more across the fire lines to the north, south, and east, entering Los Alamos Canyon towards Los Alamos, New Mexico. The towns of Los Alamos and White Rock were in the fire's path and more than 18,000 residents were evacuated. By the end of the day on May 10, the fire had burned 18,000 acres, destroying 235 homes, and damaging many other structures. The fire also spread towards the Los Alamos National Laboratory (LANL), and although fires moved onto the Facility's lands, all major structures were secured and no releases of radiation occurred. The fire also burned other private lands and portions of San Ildefonso Pueblo and Santa Clara Pueblo.

CERRO GRANDE FIRE AFTERMATH

Many residents of Los Alamos were allowed to return to their homes on May 18th, after being displaced for over a week. The damage was substantial to the western and northern portions of town, and the community was in shock. Most of the residents had never experienced a disaster of this proportion in their lifetime, and the amount of work to cleanup, rehabilitate and stabilize what remained was staggering. The incredible effort to complete these tasks was performed in concert with several local, state and federal government agencies. A Burned Area Emergency Rehabilitation (BAER) Team was tasked with helping the community address the severe impact to the Santa Fe National Forest directly west of Los Alamos. An unprecedented local volunteer effort also played a key role in completing rehabilitation work within the Los Alamos town site.

Cerro Grande fire apporaching Los Alamos National Laboratory

BURNED AREA EMERGENCY REHABILITATION (BAER)

BAER Teams are formed after major fires to assess damage caused by the fire and to implement a rehabilitation plan that will prevent loss of life and property and reduce further natural resource damage. BAER Teams are composed of highly skilled wildlife biologists, archaeologists, soils scientists, landscape architects, geologists, ecologists, engineers, foresters, botanists, GIS and GPS specialists and other disciplines from all over the Nation.

There are a variety of rehabilitation techniques that the BAER team recommended. Reseeding of ground cover, construction of straw bale dams for small streams, placement of fallen trees to catch sediments on steep slopes and digging of below-grade pits to catch runoff and sediments are the primary techniques used by the BAER team. The team also assessed the need to modify drainage structures such as installing debris traps, enlarging culverts, installing standup inlet pipes to allow drainage to flow if culverts become plugged, adding additional culverts and constructing emergency spillways to keep roads from washing out during floods.

LOS ALAMOS NATIONAL LABORATORY EFFORTS

Subsequent to the early formation of a rehabilitation steering team and five focus teams, Laboratory Director John Browne announced June 2nd the establishment of a ERT (Laboratory Emergency Rehabilitation Team). ERT directed an aggressive program to address potential impacts of increased runoff resulting from the Cerro Grande fire and to look at potential long-term issues arising from the fire.

In addition to the BAER team, the Laboratory has been closely consulting with outside experts to determine how best to approach this problem. In particular, the U.S. Army Corps of Engineers has studied the watersheds and the land and is recommending engineering solutions to slow down the flow of water to protect facilities and infrastructure and to minimize the potential for the movement of contaminated sediments downstream.

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Facility & Waste Operations Division - Environment, Safety & Health Division Efforts One goal of LANL's ERT was to address potential impacts of increased runoff resulting from the Cerro Grande fire and look at potential long-term issues resulting from the fire.

The land treatment done by rehabilitation crews included removal of hazardous trees, contour falling, contour raking, seeding, straw mulching, placement of straw wattles on contour (20' biodegradable mesh tubes filled with straw), log structures and rock check dams. Mulch (hydro mulch or straw mulch) is used to cover raked and seeded areas in order to provide a place for seed germination. Land rehabilitation treatment such as tree felling, raking, wattle placement, log structures and rock check dams are all done on the contour in order to decrease erosion caused by water runoff.

Environmental Restoration Project Activities - Established in 1989 as part of a Department of Energy nation-wide program, the LANL Environmental Restoration Project is designed to find out if hazardous chemical and/or radioactive wastes are present as a result of past LANL operations. Those sites where such materials are still found and that require remediation are being cleaned up in order to protect public health and the environment, in accordance with the requirements of LANL's Hazardous Waste Facility Permit.

In general, the contaminants found in potential release sites were deposited during the 1940s and 1950s. Over the course of the last 50 years, soil and other materials have been deposited on top of the contaminants, putting them at least 12 -18 inches below the surface at most of the sites. Initial reports indicate that the fire burned only the top 3 inches of the ground in most places. Thus, it may be unlikely that contaminants would have been released from most sites that were burned.

- The majority of the sites have been evaluated and a large percentage was found to contain no contamination or insignificant quantities of chemical or radioactive contamination. The sites are called "potential release sites," or PRSs, because they may or may not contain contamination.
- After the fire, New Mexico Environment Department and Laboratory crews evaluated all PRSs located in the burned area to see which ones had been touched by flame. The joint crews determined that 315 PRSs had been touched by flame in the fire. They then evaluated the 315 sites to determine which ones needed erosion control measures, called Best Management Practices, or BMPs.
- A review of previously completed Surface Water Site Assessments was performed to assess the "pre-fire" erosion potential of each of these PRSs. Of the 315 PRSs affected by the fire, 91 were recommended for BMPs.
- Laboratory field teams have completed placement of BMPs at the 91 PRSs. BMPs include the placing of protective jute matting, hand reseeding, rock check dams, log-silt barriers and straw wattles, as well as other actions to control runoff and erosion.

The issue with these sites is not the fire, but the aftermath of the fire. Soil and sediment will be displaced when rains begin to wash down the canyons. Soil erosion experts predict much heavier runoff in the canyons than before the fire because the soil and vegetation on the hillsides is no longer able to absorb rainwater runoff, which would have slowed its course into and through the canyons.

Rainwater runoff can displace these contaminated soils and sediments and transport them down the canyons and, potentially, off LANL property. LANL scientists are working together with the US Forest Service to evaluate this situation, and are now planning work to minimize the impacts of the expected floods prior to the beginning of the summer rainy season.

Ames, Iowa - Ames Laboratory

"TIE serves an important role within EM by facilitating the exchange of experiences among people from different sites. I enjoy the quarterly and the meeting because it exposes me to more of the EM family than I normally encounter."

US ARMY CORP OF ENGINEERS

The U.S. Army Corps of Engineers is a major Army command with a broad set of missions and capabilities. One of its missions is to provide assistance, within its authorities, when natural disasters or other emergencies occur. Emergency preparedness and response is primarily a state and local responsibility. However, in instances when the nature of the disaster exceeds the capabilities of state and local interests, the Corps of Engineers may provide help to save human life, to prevent immediate human suffering or mitigate property damage. In this instance, their help includes:

- Low-Head Filter Weir Los Alamos Canyon - Construct [a] low-head weir to retain sediment during high water flows.
- Retention Dam in Pajarito Canyon - Installation of a Roller Constructed Concrete flood retention structure in Pajarito Canyon: Height - 70 ft, Base Length - 215 ft, Crest Length - 390 ft, Crest Width - 20 ft. One 42-inch culvert will extend through the base of the structure at the streambed; outflow will be restricted to less than 400 cfs.
- Emergency Road Hardening- To protect the Hwy 501 crossing of Water, Two-Mile and Pajarito Canyons, by hardening embankments using shotcrete.

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- **LA Reservoir Drainage** - The existing Los Alamos Canyon Reservoir was drained to accommodate the expected large volumes of runoff, ash and debris from the upper watershed. The dam embankment was hard armoured.
- **Diamond Drive Crossing** - Protect the Diamond Drive crossing of Pueblo Canyon by installing, "jacking and boring," a 432-foot, 86-inch [diameter] steel pipe culvert through the existing embankment.

WHEN WILL THE FOREST COME BACK? (Courtesy of the Santa Fe New Mexican, June 2000)

With over 45,000 acres of forest destroyed, many wonder if or when the forest will come back. "It depends on what kind of forest you want," said John Peterson, district ranger for the Jemez ranger district in the Santa Fe National Forest. "You want an old-growth forest? 300 years". You want an early-serial (young) forest? It'll be there next year."

A healthy forest is a constantly evolving medley of diverse ecosystems with trees that tend to be of varying ages and sizes. Fire is an essential, natural process that helps to shape those ecosystems. But present fire patterns differ greatly from historic burns. During the last century, human activities such as timber harvests, cattle grazing and fire suppression have disturbed the natural processes of Southwestern forests, creating crowded, water-starved stands of timber. The forests have more trees than ever.

As a result, the Cerro Grande fire burned with such ferocity that some human tinkering would be required to begin new growth in some places. But in other spots, the fire flashed through the forest at lesser intensities - like a natural fire would, or like a controlled burn is designed to do - clearing out undergrowth, thinning smaller saplings and opening the forest canopy overhead. To get a picture of what much of the Cerro Grande burn area will look like in the years to come, look no further than the sites of the 1998 Oso fire, the 1996 Dome fire and the 1977 La Mesa fire - all in the Jemez Mountains. "They are all on this side of the mountain, and they all deal with ponderosa pines," Peterson said. The site of the 1998 Oso fire is a patchwork of herbaceous grasses and small shrubs. The decomposition and recycling of organic matter is slow in the arid southwest. Fire expedites a return to the soil of nutrients from wood and plants.

The 1996 Dome fire burned much hotter than the 1998 Oso fire, and a large amount of the area had to be reseeded. About 5,000 seeds per acre were scattered across the landscape. The area is rolling grasslands with a mix of brushy oaks and aspen groves. Snags of dead trees are strewn about, providing homes for small mammals, as well as birds, reptiles and invertebrates. Rodents aerate the soil and spread seeds, jump-starting more new growth.

The site of La Mesa fire, which burned 23 years ago, has stands of ponderosa pines, with the largest ones reaching about 15 feet high. Open grasslands stretch out between the trees.

Ponderosa pines are the dominant trees of the transitional life zone, an area with an elevation of 5,000 to 8,500 feet. At the lowest elevation of the transitional zone, ponderosas mingle with piñon, juniper and Gambel oak. Up higher, the forest is an array of mixed conifers where the ponderosas begin to yield ground to Douglas firs, blue spruces, limber pines and white firs. Oak, which usually grows more like a bush than a tree in the arid mountains of the Southwest, can sprout as soon as four weeks after a fire even without rain, because its roots often survive a fire. Grasses should spring up with the first rain. The oldest, largest ponderosas often can survive small fires. The ponderosa's bark acts as a heat shield, and its dense wood is difficult for flames to penetrate. Ponderosa pines are usually slow starters, growing only two to three inches in their first years with 7 to 12 inches of taproot growing underneath. Crown-like caps form on top of their shoots, and stronger root systems are developed after two years.

If the pines have to compete for water and sunlight, most are only about 1½ feet tall by age 8. "If it's an open-growing situation and has good water, it's going to grow fast right from the beginning," said Travis Moseley, range and watershed staff officer for the Jemez ranger district. At 10 to 15 years old, ponderosas begin a 150-year growth spurt. The sun-loving ponderosas compete in a mad race to the sky, growing as fast as 2 feet each year. At that point, "Roots spread out, and they're not only better able to exploit the surface water that comes in small storm events, but they also (fare better) in dry, drought periods," Moseley said. Ponderosas reach maturity at about 300 years and live as long as 660 years. In hydrophobic areas, Moseley says, it could take as long as two years for the seeds to germinate. But in hydrophobic soils [(conditions where water absorption into the soil is greatly diminished)] left after the Dome fire, germination happened within six months. "After the monsoons came in, the seeds took hold, and it began breaking that (hydrophobic layer) down," he said.

CONCLUSION

The Cerro Grande Fire was the largest and most destructive in New Mexico history. The devastation to the community, the forest and the Laboratory will not soon be forgotten. But there is a cause for optimism; the massive rehabilitation effort by volunteers, local/state/federal government agencies and the Los Alamos National Laboratory have been implemented before any substantial flooding has occurred. There may be additional setbacks along the way to recovery, but the community is beginning a long healing process.

A New Disposal Option for Mixed Waste Debris

Since January 2000, the Department of Energy's Oak Ridge Operations Office (DOE-ORO) has made use of a new option to treat and store mixed waste debris, reduce its volume and storage costs, and protect the environment. This new method is the Arrow-Pak Mixed Waste Debris Macroencapsulation process.

Arrow-Paks being offloaded once received at Envirocare.

Project funding came from the TRU and Mixed Waste Focus Area (TMFA) located at the Department of Energy's Idaho National Engineering and Environmental Laboratory.

An Arrow-Pak is a high-density polyethylene tube, about 21-feet in length and 30-inches in diameter. Each Arrow-Pak typically holds the equivalent of 21 55-gallon drums of mixed waste debris. The Arrow-Pak works in this manner:

The mixed waste debris is loaded into 55-gallon drums. Once filled, a "supercompactor" crushes these drums into approximately 12-inch thick "pucks." Three such pucks can be loaded into a standard 85-gallon metal drum known as an "overpack." Seven overpacks fit into each Arrow-Pak.

Oak Ridge is the first to use Arrow-Paks to dispose of mixed waste at a commercial site. This process was used several years ago for encapsulation and storage of waste at DOE's Hanford, Washington site.

Currently, DOE-ORO's East Tennessee Technology Park is shipping mixed waste debris in Arrow-Paks to a Utah location owned by Envirocare of Utah, Inc, for disposal.

As a direct result of this success, several DOE sites have expressed interest in this technology.

The Arrow-Pak approach achieves a mixed waste debris volume one-half that of the conventional macroencapsulation approach. That process loads uncompacted debris into metal containers that are injected with melted low-density polyethylene to fill the empty airspace.

"The thing that makes this technology really advantageous is the volume reduction you can achieve through compaction of the drums," says Bill Krummen, Oak Ridge manager for Florida International University's Hemispheric Center for Environmental Technology (FIU-HCET).

Volume is a primary factor in cost of disposal, according to Krummen. Besides the volume reduction that the technology affords, Krummen says, Arrow-Paks allow on-site treatment of mixed waste debris before it is shipped away for disposal. In addition, the one-inch-thick high-density polyethylene used to encapsulate the debris also provides a long storage life, comparable to or better than concrete.

The Arrow-Pak deployment is one of six Accelerated Site Technology Deployment programs being supported by TMFA , which was created by DOE's Office of Science and Technology to solve mixed-waste technical problems.

Arrow-Paks in disposal cell

New Orleans-based Boh Environmental, LLC developed the Arrow-Pak system. FIU-HCET was assigned project management responsibility by the DOE-ORO, and is evaluating the technology's performance and cost-effectiveness as a means of mixed waste debris treatment.

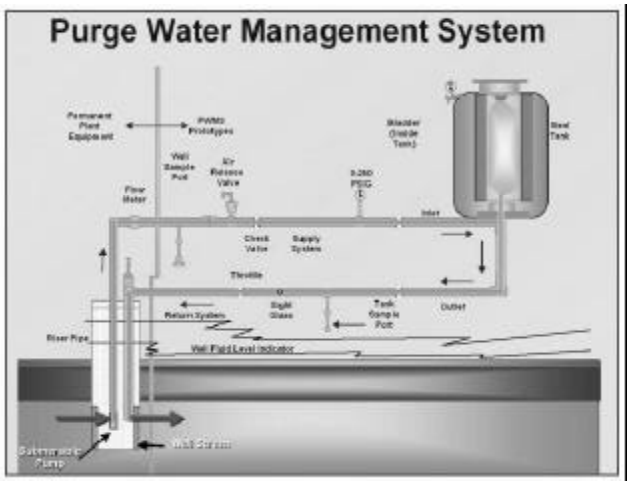
For more information contact Dave Hutchins, Oak Ridge Operations Office at (865)241-6420, hutchinsda@oro.doe.gov

Oakland, California - Lawrence Livermore National Laboratory

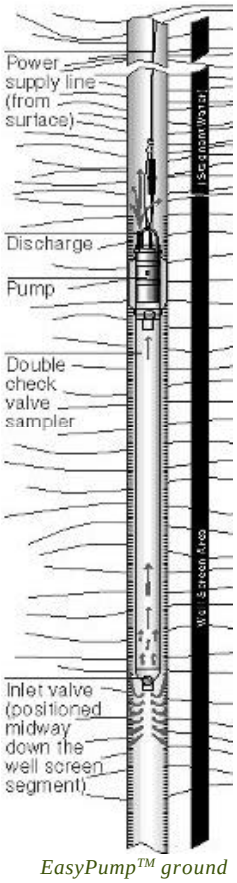
"I enjoy the informal setting of the TIE Workshop and the access to other DOE field personnel and DOE contractors doing the same work; exchanging solutions to what worked and what didn't work. It is also an opportunity to realize what innovative technologies are currently being applied by the end-users."

Savannah River and Lawrence Livermore Share Environmental Technologies

When sampling an aquifer, it is standard practice to purge the well by pumping three to four well volumes, an average of 150 gallons of purge water, before taking the actual sample. Purge water must be managed as a hazardous waste when containing hazardous and/or radiological constituents exceeding certain threshold levels. This purge water cannot be dumped on the ground; it must be containerized and managed in accordance with environmental regulations.

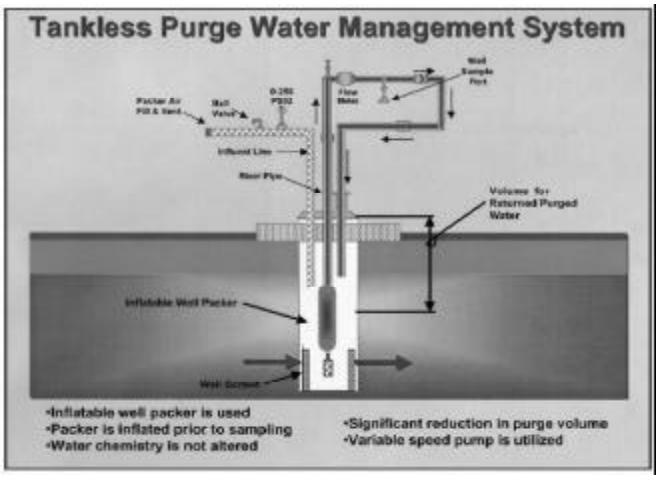


Scientists and engineers at the Savannah River Site (SRS) have developed a method, called the Purge Water Management System (PWMS), that is easily connected to existing wells, allows for vigorous purging, and circumvents the need to containerize, transport, and treat contaminated purge water. PWMS is a closed-loop non-contact system that allows water purged from sampling a ground water monitoring well to be returned to the origination aquifer without generating waste or significantly altering the water quality. Two versions of the PWMS system are currently available: the "Tank Model" and the "Tankless Model." The adjoining diagrams show schematically how the each model works - and both prevent exposure of the water to the atmosphere.



EasyPump™ ground water monitoring well sampling system

Scientists and engineers at Lawrence Livermore National Laboratory (LLNL) have also developed a technology, the Easy Pump Sampling System that allows ground water samples to be obtained without generating waste. With this system, a disposable sampler is lowered into the well until the lower end is positioned in the well screen area. An inflatable bladder (collar) at the upper end of the sampler is used to isolate the region to be sampled from the stagnant water column above the sample region and an attached submersible pump pulls water through the sampler, discharging the sampler purge water into the water column above the inflated bladder.



SRS has deployed 28 PWMS systems, including two at LLNL, with plans to install nearly 400 by fiscal year 2005. They also plan to try Easy Pump sampling systems at their site. These technologies are estimated to save in excess of $15 million over the next 30 years in treatment and disposal costs, eliminate millions of gallons of purge water, improve sampling technology, and reduce waste. In addition, LLNL and SRS Engineers - working together - determined that Easy Pump and PWMS could potentially be applied at a number of Department of Energy sites to help improve ground water sampling methodology, data quality, and waste reduction.

The EasyPump™ system is now commercially available from Voss Technologies, Inc., San Antonio Texas (1-800-247-6294 or www.vosstech.com). Presentations on both systems are planned for the November TIE Workshop.

Idaho Falls, Idaho - Idaho National Engineering and Environmental Laboratory

"The TIE Workshops saves DOE money by encouraging people to share their successes and failures or lessons learned. Databases, memos, and teleconferences cannot take the place of one-on-one interactions with people with experiences to share and pictures to show. It encourages people to not reinvent the wheel at each site."

Small-diameter Geophysical Logging System Saves Money at Hanford

The Environmental Restoration Contractor team, led by Bechtel Hanford Inc., is using a new technology to reduce the amount of soil requiring removal from Hanford's F Area by nearly 200,000 tons and avoiding more than $7 million in waste disposal costs. The F Area is located along the Columbia River and is the site of one of Hanford's nine defunct plutonium production reactors.

The technology being used at F Area is called the Small-Diameter Geophysical Logging System (SDGLS). It uses a probe inside a small-diameter tube to measure and distinguish between naturally occurring and man-made gamma radiation in the soil. It provides a less expensive and faster way - compared to standard borehole drilling methods - to determine the extent of gamma-emitting contaminants at a site.

With the support of the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy's Return-on-Investment program, Bechtel Hanford used SDGLS at a coal ash pit near the F Reactor. Results from the new testing procedure showed the ash pile contained a large amount of naturally occurring radioactive materials that did not require disposal at Hanford's Environmental Restoration Disposal Facility. As a result, the amount of soil to be remediated was reduced by about 200,000 tons with a projected cost avoidance of $7,351,000.

The technology is another tool to improve cleanup efforts at Hanford. Faster and cheaper sampling techniques will allow more effective identification of contaminated soil that must be remediated.

Oak Ridge, Tennessee - Oak Ridge National Laboratory

"I think the value of the TIE Workshop is evident from the tremendous participation and from the diversity of the participants. It is probably the best forum for bringing the state and federal government organizations, regulators, contractors and vendors together, face-to-face, to focus on and discuss, not just problems but actual solutions. This type of practical exchange of information is important for evaluating field-tested approaches to problems not just conceptual approaches. The [TIE Quarterly] is a way of disseminating this same type of practical information to a larger group than those attending the workshop. It also allows the projects to stay current with technology applications and approaches and help the sites reach a much broader audience than could be achieved by just a workshop."

With SDGLS, a hydraulic driver pushes a small-diameter tube up to 33 feet into the soil. A probe is then lowered into the tube to measure the gamma radiation in the surrounding soil. Up to five sample points can be completed in a single day. As the probe is lowered into the tube, scientists log data, which are analyzed within 24 hours. The sample points are then closed and decommissioned.

Field deployment of the small diameter geophysical logging system at the 126-F-1 Ash Pit on the Hanford Site

Without the new technology, several large boreholes would have to be drilled. The cost and time involved with regular borehole drilling limits how precisely the contaminated soil can be mapped. In addition to being expensive, borehole drilling also generates a considerable amount of secondary waste, which must be disposed.

The logging system was developed from existing equipment and logging technology by a team from CH2M Hill Hanford Inc., a preselected subcontractor to Bechtel Hanford, Three Rivers Scientific, and Northwest Geophysics. Geoprobes are commonly used for chemical soil analyses. However, the addition of a sensitive SDGLS probe was a new adaptation of the equipment. DOE's Return-on-Investment program funded the development and testing of the equipment. Bechtel Hanford and DOE calibrated the equipment by testing it at sites where contamination data had already been obtained.

The ash pit remediation site is now undergoing final testing to confirm that it meets regulatory cleanup standards, a process that also is benefiting the new technology. Dennis Faulk, F Area Project Manager for the EPA, said the new probe "has the potential to greatly reduce analytical costs associated with the site close out verification." Based on the success of the ash pit effort, the SDGLS technology will likely be used at other radioactive waste sites at Hanford.

More TIE "Clips"

Richland, Washington -- Hanford

"In the past, the presentations at TIE workshops have focused on the outcome of real work -- not planned work, paper studies, or sales pitches. This has provided the opportunity for real projects facing real problems to interface with others who have experienced similar problems. The TIE workshops provide an invaluable, face-to-face forum for the people doing the work to communicate successes and lessons learned. The TIE Quarterly provides a similar service in the form of a periodical."

Kansas City, Kansas - Allied Signal

"TIE is important because it gives the field engineer level a place to present and discuss technology successes and failures. It is believed to reduce the frequency of DOE sites learning the same lessons independently. I know from some of the feedback we have received that sites are benefiting from work done at other sites... thus saving time and money for DOE."

Albuquerque, New Mexico - Sandia National Laboratories

"...The TIE Workshop is the ONLY effective mechanism in the U.S. by which environmental scientists and engineers can engage in site-by-site and project-by-project lessons learned analysis. After 10 years of careful execution, the TIE Workshop is recognized as the annual event of choice for environmental professionals in obtaining critical information about technical activities, cost, schedule, worker safety and health, and risk analysis. Integration and successful implementation of these data is the most significant challenge facing the DOE and other federal agencies in capturing the trust and confidence of regulators, local and state officials, stakeholders, Tribal Nations and the American people."

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